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LANTUN, NAURIIN JA RYPSIN SIEMENTEN KÄSITTELYN VAIKUTUS ITÄMISEEN JA TAIMETTUMISEEN

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Introduction

In the year 1958, control trials against flea beetles and cabbage root flies were arranged at Tikkurila, where the seeds were treated with different insecticides.

In these field trials it was established that some treatments retarded the emergence of seedlings, but the differences were equalized out after some weeks. The retarding effect appeared most distinctly in swedes, while it was very slight in turnip. As rather promising results were obtained from seed treatment in these experiments, it seemed necessary to investigate in detail the harmful effect which insecticides used in seed treatment of swede, turnip and winter turnip rape might have on the germination and emergence of seedlings.

Materials and methods

The following experimental plants were used: swede: variety Mustiala, 96 % germination according to the official seed analysis certificate; turnip: variety Teutoburger 97 % germination; winter turnip rape: variety Gruber, 98 % germination. The insecticides used in treatment, their amounts and the amount of sticker used are given below. Purified paraffin oil was used as a sticker the amount varying according to the amount of insecticide.

	Active ingredient %	Insecticide	Dosage g/kg	Amount of sticker ccm/kg
1.	40	Aldrin	800	100
2.	50	Dieldrin	400	60
3.	50	Dieldrin	600	90
4.	25	Heptachlor	1 000	100
5.	75 + 10	Lindane + thiram	120	20
6.	75 + 10	Lindane + thiram	160	30
7.	75 + 10	Lindane + thiram	240	40
8.	1.5	Parathion	600	90
9.	1.5	Parathion	1 000	100
10.		Untreated		

The effect of the thickness of the powder and sticker crust on the germination was studied by using talcum powder instead of the corresponding amount of insecticide.

Germination tests were carried out in Jacobsen's germinator. The treated seeds were put in shut glass bottles and kept in the dark at a temperature of +13—15° C. Three germinations were undertaken with each plant species, the first one 1—4 days after treatment, the second one 3—7 weeks after treatment and the third one 25—35 weeks after treatment. The tests were inspected on the 4th, 7th and 10th days after they were started. Each treatment comprised 4 × 100 seeds.

The emergence of seedlings was investigated in swedes by pot experiments arranged in greenhouses and by field trials. The treated seeds were sown in mineral soil rich in organic matter in clay pots. In each treatment there were 4 × 100 seeds; half of these (2 × 100) were kept normally moist, being watered before the sowing and three times in 10 days after it, while the other half were kept rather dry, being watered before the sowing and then twice during 10 days.

Field experiments were carried out on sandy and peat soil and observations were made 6, 10—14 and 21 days after sowing. The estimation was made according to a scale of 0—10, (0 = no emergence, 10 = rather dense and even emergence). Not only the density of growth, but also the vigorousness affected the value.

Results

When estimating the results it must be taken into consideration that it was not possible to ensure that all the seed coats were covered by a completely even and equally thick crust of insecticide. In addition to this the possible unevenness in the depth of sowing affected the emergence values obtained on the basis of field experiments.

Germination. According to germination tests, the treatments affected harmfully the germination of all the experimental plants, retarding it and in most cases increasing the number of sterile seeds and also of deformed seedlings (Figure 1). The harmful effect was greatest in swedes and least in turnip rape. In France Bonnemaison and Jourdheuil (1954) investigated the effect of seed treatment on the germination of rape. According to their results all the treatments (lindane, DDT, aldrin and parathion dry treatment and lindane, HCH and ethyl and methyl parathion liquid treatment) retarded and reduced the germination, slightly in the case of dry treatment, byt very severely in the case of liquid treatment. In Norway the amounts of dieldrin (50 % 100 g/kg and 90 % 55 g/kg) and lindane (50 % 70 g/kg and 75 % 45 g/kg) used in seed treatment of swedes did not reduce germi-

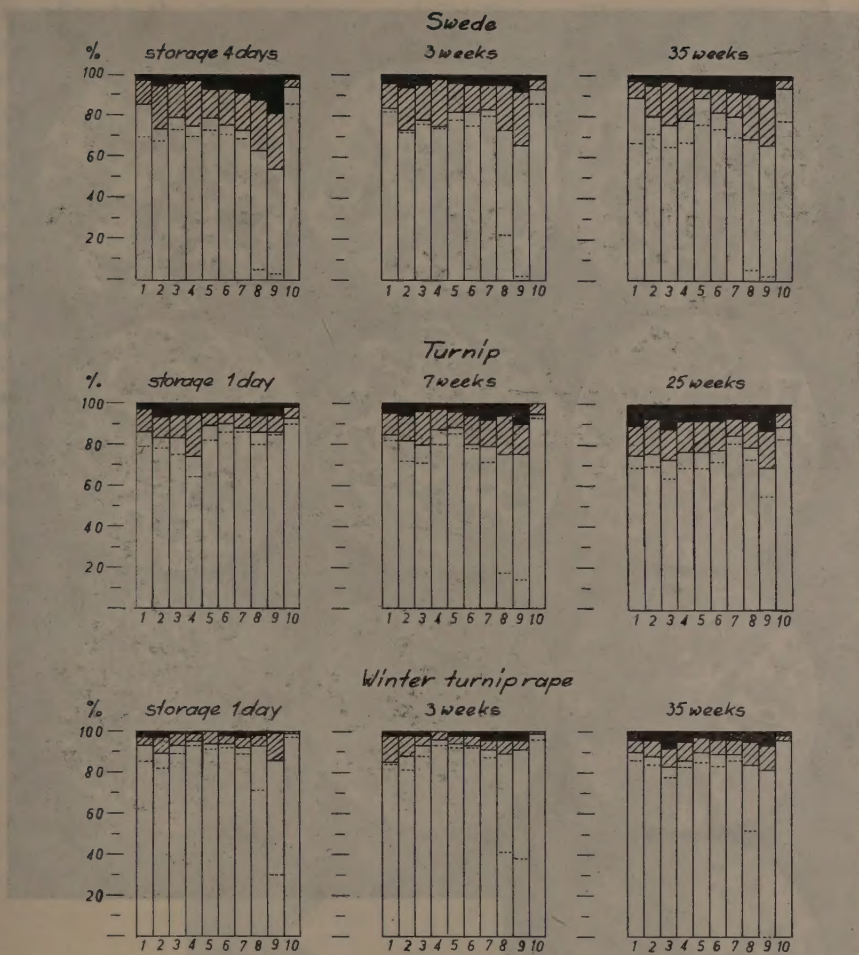

Figure 1. The effect of storage on the germination on the seeds of swede, turnip and winter turnip rape treated with different insecticides (g/kg). Orig.

☐ Healthy seedlings. The dotted line indicates the number of healthy seedlings on the 4th day after the start of the experiment

▨ Deformed seedlings ■ Sterile seeds

Treatments

1. 40 % aldrin 800 g
2. 50 % dieldrin 400 g
3. 50 % dieldrin 600 g
4. 25 % heptachlor 1 000 g
5. 75 + 10 % lindane + thiram 120 g
6. 75 + 10 % lindane + thiram 160 g
7. 75 + 10 % lindane + thiram 240 g
8. 1.5 % parathion 600 g
9. 1.5 % parathion 1 000 g
10. Untreated

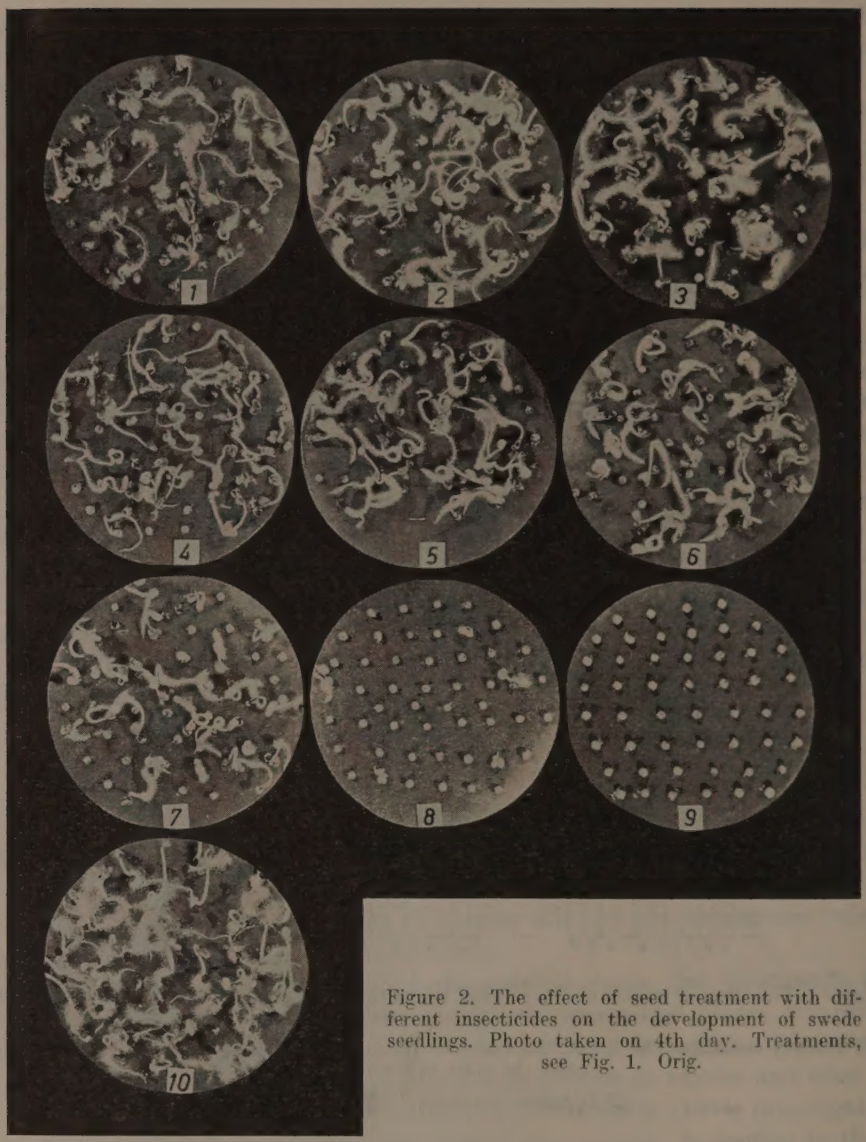

Figure 2. The effect of seed treatment with different insecticides on the development of swede seedlings. Photo taken on 4th day. Treatments, see Fig. 1. Orig.

nation (Stenseth 1958). — In our experiments the storage of treated seeds did not significantly increase the injurious effect of the preparations. In Denmark, seed treatment with aldrin and lindane reduced the germination of swedes, but storage in sacks for 2—3 months and in closed glass bottles did not cause further reduction in the germination (Hammarlund 1958)

According to the investigations made in Norway (STENSETH 1960) a year's storage in paper bags of swede seeds treated with lindane and dieldrin did not cause poorer germination.

Some differences which should be taken into consideration occurred between the experimental plants in our germination tests. The retarding effect of parathion appeared most distinctly in swedes, where it also led to the greatest increase in the number of sterile seeds and in the number of deformed seedlings. In swedes the harmful effect was least when aldrin and small amounts of lindane were used. On the whole storage somewhat mitigated the phytotoxicity. — In turnip parathion did not have such an effect as in swedes, and the effect did not differ considerably from that of chlorinated hydrocarbons. Storage of the turnip seeds slightly increased the harmful effect of the preparation. In winter turnip rape parathion retarded germination, but its effect on the final result of germination was not much more harmful than that of the other preparations. Storage also increased the injurious effect of the preparations on germination in turnip rape. Figure 2

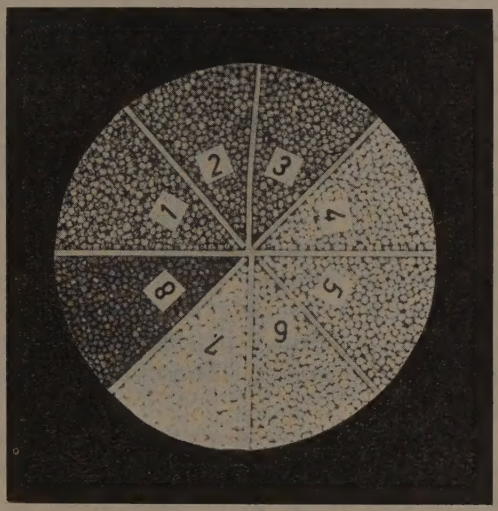

Figure 3. The seeds of swede incrusted with different amounts of talc. Paraffin oil has been used as a sticker. Orig.

Treatments

1. Talc . 120 g, paraffin oil 20 ccm/kg
2. Talc 160 g, paraffin oil 30 ccm/kg
3. Talc 240 g, paraffin oil 40 ccm/kg
4. Talc 400 g, paraffin oil 60 ccm/kg
5. Talc 600 g, paraffin oil 90 ccm/kg
6. Talc 800 g, paraffin oil 100 ccm/kg
7. Talc 1 000 g, paraffin oil 100 ccm/kg
8. Untreated

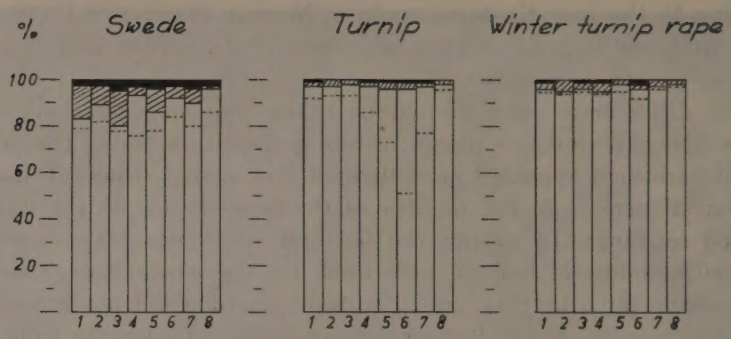

Figure 4. The effect of the thickness of the crust of talc and paraffin oil on the germination of swede, turnip and turnip rape. Treatments, see Fig. 3. Orig.

☐ Healthy seedlings. The dotted line indicates the number of healthy seedlings on the 4th day after the start of the experiment

▨ Deformed seedlings ■ Sterile seeds

presents the effect of different preparations on the development of swede seedlings. Treated seeds were stored for 35 weeks and the photo was taken on the fourth day after the beginning of the test.

The crust of powder and sticker (Fig. 3) on the seed surface caused poorer germination in the swedes, but the thickness of the crust had almost no effect. In turnip the germination was retarded according to the thickness of the crust, but the final quantity of germinated seeds was not affected.

In turnip rape the crust of powder and sticker had no effect worth mentioning (Fig. 4).

The emergence of seedlings. In pot experiments the insecticides used in seed treatment affected the emergence of swede seedlings in moist soil in the same way as they affected the germination in the germination tests. In dry soil aldrin, heptachlor and parathion caused rather severe deterioration in the emergence. The results are presented in detail in Figure 5.

Observations made in field experiments (Table 1) indicate that the treatments retarded the emergence and the development of seedlings. The result thus corresponds with that of the germination tests, as well as with the results obtained by Bonnemaison and Jourdheuil (1954). Parathion had the most harmful effect, but in many cases the biggest quantity of lindane still had a distinct phytotoxic effect 3 weeks after sowing, whereas the differences between other treatments were almost entirely equalized by then. Nolte (1959) has observed that the treatment of rape seed with lindane (100 g/kg and 150 g/kg of 50 % preparation) retarded the emergence of seedlings, but the plants which developed from treated seeds recovered quickly, however, and after some weeks they were even stronger than the untreated ones.

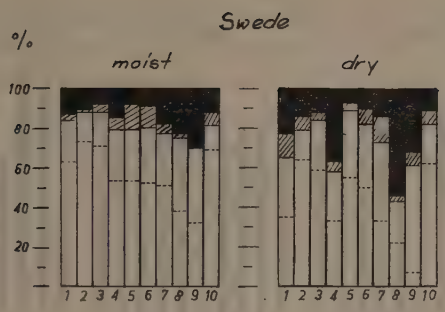

Figure 5. The effect of seed treatment on the emergence of seedlings of swede on moist and dry soil. Treatments, see Fig. 1. Orig,

☐ Healthy seedlings. The dotted line indicates the number of healthy seedlings on the 4th day after the start of the experiment

▨ Deformed seedlings ■ Sterile seeds

Table 1. The effect of different insecticides on the emergence and development of swede, turnip and winter turnip rape seedlings in field experiments. The estimation is made according to a scale 0—10 (0 = no emergence, 10 = rather dense and even emergence). The vigorousness of the seedlings affected the values. The observations were made 6, 10 and 21 days after sowing.

Active ingredient %	Insecticide	Dosage g/kg	Swede			Turnip			Turnip rape		
			6	10	21	6	10	21	6	10	21
	Sandy soil										
40	Aldrin	800	+	6	7	3½	7½	8½	4½	8	9
50	Dieldrin	400	3	7½	8½	3½	7½	8½	4½	9—	10
50	Dieldrin	600	3	7	8	3½	7½	8—	4½	8½	9½
25	Heptachlor	1 000	4	7½	8	3½	6½	7½	3½	7½	8½
75+10	Lindane + thiram ..	120	2	8	9	3½	8	9—	2½	8½	9½
75+10	Lindane + thiram ..	160	2	7½	9	3½	7½	9—	1½	8½	9
75+10	Lindane + thiram ..	240	2	7½	8½	3½	7	8—	2—	7½	8½
1.5	Parathion	600	+	1½	4	+	1	2—	1½	6½	6
1.5	Parathion	1 000	+	1	3½	+	+	1½	½	5½	4½
	Untreated		4	8	9	4—	8—	9	4½	9	10
	Peat soil										
40	Aldrin	800	1	7	8½	8—	10—	10	7½	9½	10
50	Dieldrin	400	1	7	9	8—	10	10	8	10—	10
50	Dieldrin	600	2	8	9	7½	9½	10	7	9—	10—
25	Heptachlor	1 000	1	6½	8	5—	6	8	6	7—	8—
75+10	Lindane + thiram ..	120	2	8	9	8	10—	10	8	9	10
75+10	Lindane + thiram ..	160	1	7	9	7½	10—	10	8	9	10
75+10	Lindane + thiram ..	240	+	6	8½	6—	9½	10	7	9—	10—
1.5	Parathion	600	+	6	7	5—	6½	7½	6½	7½	8
1.5	Parathion	1 000	0	3	5	2	4½	6½	4½	6—	7
	Untreated		3	9	9	9	10	10	9	10	10

In the experiments on sandy soil the swede seeds were treated 8 weeks before sowing, the turnip seeds 4 weeks before sowing, and the turnip rape seeds one week before sowing; in the experiments on peat soil the swede seeds were treated 3 weeks before sowing, the turnip seeds 4 weeks before sowing, and the turnip rape seeds 4 weeks before sowing.

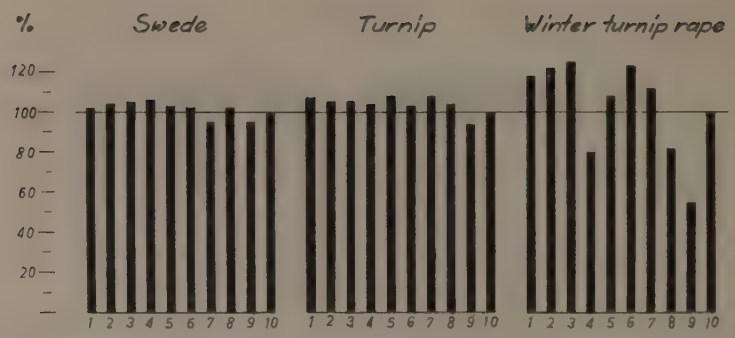

Figure 6. The effect of seed treatment on yields on peat soil. Treatments, see Fig. 1. Orig.

In our field experiments thedifferences between the stands of various treatments would evidently have been equalized better and more quickly if the seedlings had not suffered from severe drought during the commencement of their development.

The experiments on sandy soil suffered so severely from the drought that none of the yields could be weighed. The drought did not hamper the experiments on peat soil so much. The yields of different experimental plants and various treatments are presented as relative values in Figure 6. In the yields of swede and turnip (roots and foliage) there were scarcely any significant differences between the treatments. Thinning conducted at the beginning of July proved to be an equalizing factor whereas in the yield of turnip rape the phytotoxicity of heptachlor and parathion preparations was observable. On the other hand, varying efficiency of different insecticides on pests i.e. on flea beetles and cabbage root flies, affected the differences between the yields of the experimental plants.

Summary

Germination tests were made with the seeds of swede, turnip and winter turnip rape treated with aldrin, dieldrin, heptachlor, lindane and parathion. Paraffin oil was used as sticker. The effect of storage on the treated seeds was also studied and observations were made on the emergence of seedlings.

In the germination tests all the insecticides mentioned above retarded the germination of each trial plant and in most cases increased the number of sterile seeds and the amount of deformed seedlings. The phytotoxic effect

was strongest in swedes and slightest in turnip rape. The thickness of the crust on the seed surface did not affect the final amount of germinated seeds.

In pot and field trials the differences in the emergence of seedlings were, however, almost entirely equalized after three weeks. Only the harmful effect of treatment with heptachlor and parathion was lasting. The storage of treated seeds up to 35 weeks did not increase the injurious effect in swedes. In turnip and turnip rape the germination deteriorated slightly during the storage.

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Selostus

Lantun, nauriin ja rypsin siementen käsittelyn vaikutus itämiseen ja taimettumiseen

KATRI TIITTANEN ja ANNA-LIISA VARIS

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Tikkurila

Vuonna 1958 järjestetyistä kirppojen ja kaalikärpästoukkien torjuntakokeista, joissa siemenet oli käsitelty eri insektisideillä kiinnitysainetta käyttäen, tehtiin se havainto, että käsittelyt hidastivat kasvien taimettumista. Kun siementen käsittelyllä näissä kokeissa saatiin verrattain lupaavia tuloksia käsittelyjen vaikutuksesta mainittuja tuholaisia vastaan, järjestettiin v. 1959 kokeita, joissa tutkittiin käytettyjen aineiden, aldriinin, dieldriinin, heptakloorin, lindaanin ja parationin vaikutusta lantun, nauriin ja rypsin itämiseen ja taimettumiseen.

Itävyyskokeissa, jotka suoritettiin Jacobsenin idätysaltaassa Valtion Siementarkastuslaitoksen ohjeiden mukaan, hidastivat käsittelyt kaikkien mainittujen koekasvien itämistä ja useimmissa tapauksissa lisäsivät sekä täysin itämättömien siemenien että epämuodostuneiden sirkkataimien määrää. Haitallisimmin vaikutti parationi. Yleensä fytotoksinen vaikutus oli voimakkainta lantussa ja lievintä rypsissä. Siementen pinnassa olevan ainekerroksen vahvuus ei vaikuttanut lopulliseen itämistulokseen.

Kenttäkokeista tehtyjen havaintojen perusteella siementen insektisidikäsittelyn vaikutus taimettumiseen oli vastaavanlaista kuin itämiseenkin. Taimettuminen viivästyi ja taimien kehitys hidastui. Erot taimettumisessa tasoittuivat kuitenkin eri koejäsenten välillä miltei täydellisesti kolmen viikon kuluessa; ainoastaan heptakloori- ja parationikäsittelyjen haitallinen vaikutus oli pysyvää.